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RESPIRATORY DISEASES OF POULTRY

THEIR DIAGNOSIS AND CONTROL



CIRCULAR 517

UNIVERSITY OF ILLINOIS • COLLEGE OF AGRICULTURE
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OF ALL THE DISEASES that attack Illinois poultry flocks, those that involve the respiratory tract—the lungs, throat, and nasal passages—are of major importance. Impaired health, retarded development, and lowered production are the common results of these diseases, and some of them cause serious death losses.

Laboratory examination of specimens and diagnosis by one trained in this field may be necessary to promptly and surely identify different respiratory diseases. However, while laboratory diagnosis is pending, general sanitary measures to prevent the spread of the disease should be promptly employed.

Sanitary surroundings, vigorous breeding stock, and proper feed and housing are the best preventives of respiratory troubles.

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Respiratory Diseases of Poultry

By C. A. BRANDLY, ROBERT GRAHAM, and R. H. HURT*

THE FIRST STEP for the effective control of a respiratory disease is to make sure of its cause, for while the symptoms of some such diseases may be very similar or even identical, their causes may be radically different. Vitamin-A starvation, for example, may bring about symptoms similar to those caused by infectious laryngotracheitis or by gapeworms, but the trouble would be treated by attention to diet rather than by sanitary measures. Moreover there is always the possibility that two or more of these diseases may appear in a flock at the same time.

The more common diseases attacking the respiratory systems of poultry are described in this circular. The brief general symptoms that are given should help Illinois poultrymen recognize these diseases early in an attack, so precautionary measures can be taken even before the disease can be diagnosed with certainty.

GENERAL SYMPTOMS

There are several general symptoms of respiratory diseases that enable a poultryman to recognize them when they appear in his flock.

"Gaping," or gasping for air, is a common symptom of partial or complete closure of the breathing passages. Foreign material gathering in the upper part of the respiratory tract (nostrils, cleft, larynx, and trachea), may cause gasping by reducing the amount of air breathed in. Tumors, swellings, impaction of the crop or esophagus, air-sac infection, and nerve derangement also interfere with breathing.

Difficult breathing is frequently accompanied by a discharge from the eyes or nostrils, or both. Affected birds may expel exudate from the nasal cavities or trachea by coughing or sneezing. This discharge may be mucous or cheeselike and may contain blood. Irritation of the eyes and nostrils and a discharge from them may cause a bird to rub its head against its wing feathers. The resulting sticky patches on the

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feathers are easily recognized. The discharge present in the nasal cavities, sinuses, and eyes may collect in firm masses and cause swelling and bulging in these parts and may impair breathing. Rattling, bubbling, gurgling, or whistling sounds are often associated with difficult breathing.

Labored breathing without gasping may occur when the lungs are affected directly by one of the respiratory diseases. It also occurs when foul air or poisonous gases have been inhaled, so it is not a sure symptom of disease. Neither is gasping or gaping a definite symptom, for it is often observed in birds dying from injury or from causes other than those directly involving the respiratory system. Reduction in lung capacity owing to pressure by tumors, hemorrhages, ascites, or impactions occasionally causes labored breathing. Bluish discoloration (cyanosis) of the head and other tissues accompanies respiratory symptoms when the breathing is seriously impaired, from whatever cause.

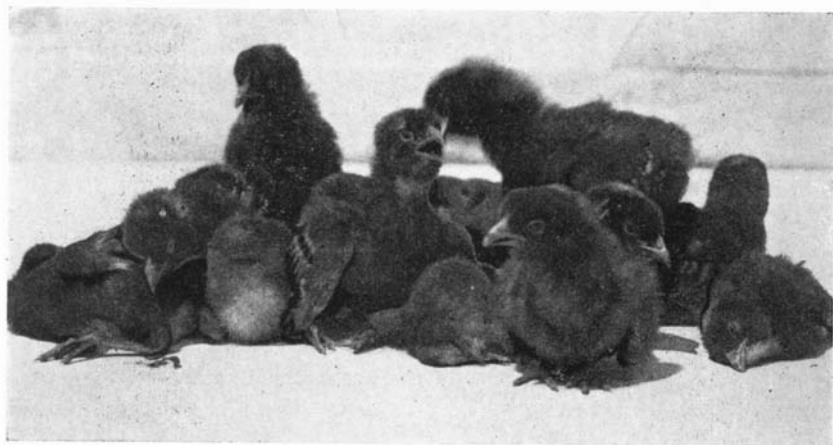
INFECTIOUS BRONCHITIS

This serious respiratory disease is caused by a virus. It attacks chickens of all ages but seldom causes heavy losses except during the first three weeks after hatching. As the chickens get older, their resistance to bronchitis increases rapidly. However, an attack of the disease may greatly retard growth of immature birds. In broods of chicks kept under farm brooding conditions and susceptible to bronchitis, death losses may range from 10 percent to as high as 80 percent of the brood. The disease is sometimes introduced upon farms by chicks from hatcheries where the infection has become established.

Gasping for air and shaking the head to clear the air passages are the most common symptoms. The gasping, or gaping, together with listlessness, interferes with feeding, and the chicks rapidly lose flesh. A watery discharge from the nasal passages, similar to that of the early stages of cold (coryza), is seen, particularly in older chickens. However, a rattling in the throat due to the movement of excess mucus may be the only noticeable symptom in older birds.

Diagnosis

Bronchitis resembles various other diseases but particularly the mild forms of laryngotracheitis, another virus disease, which is often wrongly termed bronchitis. It may be possible in post-mortem examination to differentiate between the two diseases, tho laboratory tests are often necessary.



Bronchitis in four-days-old chicks. There are no general symptoms in chicks this young that distinguish this disease from several others. Correct diagnosis often depends on laboratory examination.

In a case of bronchitis, post-mortem examination reveals a mucous exudate, or discharge, in the upper air passages as well as in the lower trachea (windpipe) and bronchi. Unlike the exudate in laryngotracheitis, however, that in bronchitis is seldom stained with blood. The bronchi are often filled with exudate, and the membranes of the air sac and heart sac are usually cloudy or definitely opaque, purulent, and thickened; this latter condition is rarely seen in other respiratory diseases. All or a part of one or both lungs may be markedly congested. The cheeselike plugs or casts of exudate usually found in the larynx in laryngotracheitis are not often observed in bronchitis. Generalized bronchitis and pneumonia may develop from a secondary invasion by various bacteria.

The laboratory test consists of injecting some exudate from a suspected bird directly into chickens that are known to be immune to laryngotracheitis or to bronchitis, or else filtering the exudate and introducing it, with immune serum for each disease, into incubating eggs. Birds or serum immune to bronchitis will neutralize the injected bronchitis virus, but birds or serum immune only to laryngotracheitis will not neutralize the bronchitis virus.

Control

Extreme care in the purchase of baby or started chicks is essential to avoid introducing bronchitis into a flock. In affected flocks a well-

balanced ration, sufficient brooder space, use of a dustless litter, and proper temperature and humidity, are the only practical control measures; there are no specific treatments. Irritating sprays or vapors may aggravate rather than lessen symptoms and losses.

There is no evidence that bronchitis is carried thru the egg, as is pullorum disease. The sudden appearance at times of bronchitis in a flock suggests that chickens which have apparently recovered may remain carriers of the infection, or the disease may be introduced onto the premises by delivery trucks, people, or wild birds which have recently visited other premises where the disease exists.

Bronchitis infection may be carried into a hatchery or starting plant with dirty eggs, feathers, or debris from the poultry houses. The hatchery or plant operator must take precautions against these probable sources of infection.

To rid a hatchery of the infection, it is necessary to dispose of all chicks, *even those not showing symptoms of infectious bronchitis*. Then all equipment, as well as walls and floors, should be thoroly cleaned and scrubbed with lye water or strong cresol solution, followed by a strong formaldehyde fumigation. High temperature and humidity are necessary during fumigation to insure full disinfection. Complete directions for fumigation and disinfection are given in Illinois Circular 403, "Incubator Hygiene."

Vaccination by the cloacal route, as employed in laryngotracheitis, may induce immunity, but this practice has definite practical limitations: a period of 1 to 2 weeks is necessary for immunity to develop after vaccination, and very young chicks have only a weak ability to develop immunity. Consequently vaccination of chicks at hatching may not give much immunity at the very time when exposure to bronchitis and mortality therefrom are most common and serious.

INFECTIOUS LARYNGOTRACHEITIS

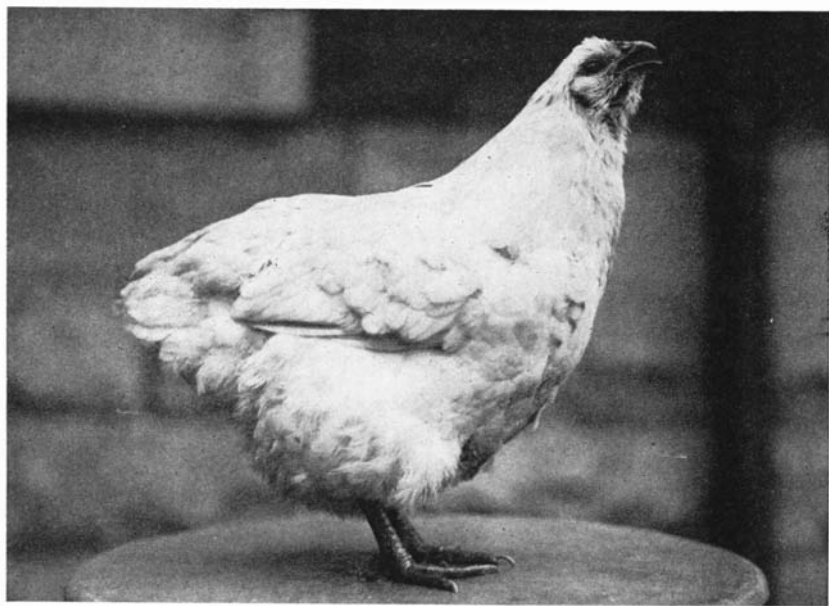
Infectious laryngotracheitis is a virus disease that attacks chickens of all ages but causes heaviest losses among pullet stock during the late fall and winter months. Occasional outbreaks of the disease are seen in younger stock during the warmer seasons, but these attacks are usually quite mild.

Chickens affected with typical laryngotracheitis have difficulty in breathing. They gasp for air and emit wheezing, rattling, and whistling sounds that are caused by exudate in the respiratory tract. Cheesy plugs may form in the larynx and close it, or blood or cheeselike material may stop up the windpipe and cause death by suffocation.

Some chickens may show a watery, sticky exudate from the eyes and nostrils, with soft, cheesy material in the eyes, sinuses, and nasal cavities appearing later. Some chickens show thin, whitish layers of exudate on the throat membranes; these may be confused with similar changes that occur in fowl-pox infection, but those in laryngotracheitis are much thinner and are easily scraped off.

The above symptoms alone are seldom sufficient to indicate that the disease is laryngotracheitis, particularly if the attack is mild. A laboratory examination is often necessary. Unless competent veterinary service has excluded other possible causes, vaccination with vaccine prepared from the affected birds should not be resorted to, for if the disease should be fowl pox and the vaccine were introduced into the cloaca, serious complications might result.

Traffic in live chickens is the most common way for laryngotracheitis to be introduced upon the premises. However, crates from buying or feeding stations have been found to be contaminated, while other possible outside sources of infection, such as visitors, straying



Pullet affected with laryngotracheitis. The acute gasping type of this disease, shown above, is inaccurately known also as "infectious bronchitis," "infectious laryngitis," "infectious tracheitis," "contagious throat cold," "hard breathing disease," "flu," and "gapes." These terms all suggest the principal symptoms—an inflammation of the larynx (the upper opening of the windpipe) and the trachea (the upper part of the windpipe).



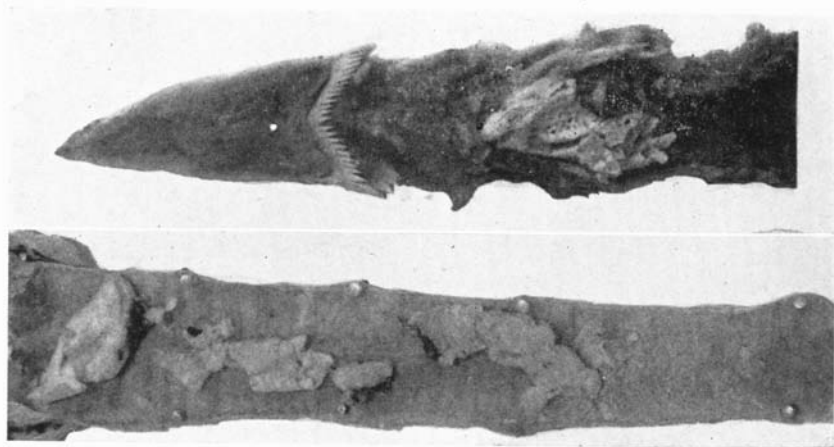
Acute laryngotracheitis in six-weeks-old chick. Affected chicks breathe with difficulty. Those that survive an attack are often stunted and unthrifty.

animals, and wild birds, must not be overlooked. No other species of birds, with the exception of pheasants, has been found susceptible to laryngotracheitis. Symptoms and lesions have been seen in geese, but they are not caused by the virus which attacks chickens.

Chickens which have apparently recovered completely from the disease may still remain carriers of the infection for an indefinite period. Consequently carrier chickens may cause future outbreaks of the disease, particularly thru contact with young susceptible stock during cold weather. The infection is not carried or transmitted in the egg.

Diagnosis

It is frequently somewhat difficult to differentiate between laryngotracheitis and bronchitis, as already noted in the discussion of bronchitis (page 4). Laryngotracheitis commonly attacks pullets in the late fall and winter months, while bronchitis is usually serious among chicks during the early brooding period. Hemorrhage, particularly severe



Evidence of laryngotracheitis. The larynx in the upper picture was closed by a yellow fibrinous diphtheritic discharge. The larynx and upper trachea in the lower picture contained an abundance of mucus and clumps of yellowish-white particles. General control measures should be instituted at once.

bleeding in the trachea, is common in acute laryngotracheitis and rare in other respiratory diseases. The membranes and exudates of the mouth, larynx, and pharynx are usually loose and may be readily scraped off in contrast to the adherent cankers of fowl pox, which leave a bleeding ulcer on removal. Definite diagnosis can be made by means of laboratory tests, but since considerable time may pass before such a diagnosis is completed, general control measures should be instituted at once and qualified local veterinary service sought immediately.

Control

As in the majority of infectious and parasitic diseases, there is no specific treatment for laryngotracheitis. Proper care, housing, and feeding are recommended, together with measures to prevent the infection spreading to other flocks and premises.

Specific preventive measures are eradication and vaccination. Of these two, eradication is usually the more effective. It requires that all stock surviving an outbreak of the disease or exposure to it be slaughtered at the end of the laying season. Those that appear normal may be sold. Then while the houses and equipment are not in use, they are thoroly cleaned and disinfected several times at intervals. The surrounding yards and runs are cultivated, and if necessary the drainage is improved. The young stock which have been raised apart on clean range may be brought to the laying houses in fall with relative safety.

Vaccination may be advantageous in areas of intensive poultry production where laryngotracheitis is prevalent or where there is continual danger of the disease being introduced. Vaccination with active laryngotracheitis virus has been practiced successfully for a number of years. However, the definite limitations and hazards of the practice must always be kept in mind in order to avoid serious difficulty.

Where vaccination is to be relied upon, all young chickens on the premises (especially those 2 to 4 months old) should be vaccinated annually by the cloacal method, preferably during the warm, dry months. Older stock which have had the disease during an outbreak or which previously have been vaccinated successfully need not be vaccinated. Proper care of the virus in order to prevent any loss in its potency and extreme care to insure proper vaccination are essential. Satisfactory takes should be seen 4 to 6 days after vaccination in at least 95 percent of the chickens known to be susceptible. A satisfactory take shows definite moist inflammatory reddening with some discharge in the form of yellowish-white stringy flecks. Birds which do not show a satisfactory take usually have not been vaccinated properly. These negative birds should be removed from the flock or revaccinated; otherwise, they usually develop the typical disease during the following 3 or 4 weeks as a result of contact with the birds showing takes. Birds showing satisfactory takes are reported by some investigators as not developing into permanent carriers.

Emergency vaccination immediately after the appearance of the first cases of laryngotracheitis in a flock may prevent spread of infection and heavy losses. This may be particularly true where the flock is divided into more or less isolated units, and recognition of the disease in one unit allows prompt vaccination of the remaining stock. In Illinois, emergency vaccination with vaccine prepared from typically sick chickens has been reported by several veterinarians to have the advantage over the use of commercial vaccines.

FOWL POX

Fowl pox is another virus disease which may infect the respiratory tract of all species of poultry. In many outbreaks only the unfeathered skin is involved, and on it develop wartlike lesions of various sizes. This infection may extend to the eyelids and the membranes of the mouth and throat. In a few flocks only the mouth and throat membranes are affected; this form of pox infection is commonly called canker or avian diphtheria. It is seldom, however, that an outbreak occurs in a flock without there being some cases in which both the



Diphtheritic type of fowl pox. The roof of the mouth and the upper end of the windpipe of this bird are involved. Yellowish particles adhere firmly to the mucous membrane of the mouth and tongue. If patches develop about the larynx or windpipe, a chicken may have difficulty in breathing. Where this diphtheritic type of fowl pox occurs in a flock, the comb or wattle type may also occur. Avian diphtheria is not related to diphtheria in man.

skin and mucous membrane are affected. A nasal form of pox has been described; but nasal discharge and sinus distension seen in pox cases are usually a result of the general disturbance of the health of the bird. Moreover, it is probable that symptoms of "cold" (coryza) and of other diseases present at the time of an outbreak of pox have not been recognized or distinguished from symptoms of pox.

Fowl pox is spread by direct contact, particularly as a result of fighting and pecking. Mosquitoes and biting flies spread the disease readily, especially in young stock. Pox infection persists on contaminated premises from year to year.

Primary pox involvement of the trachea and larynx is rare, but extension of pox infection from the mouth and pharynx to the larynx and sometimes to the trachea occurs occasionally. When this happens,

swelling of the infected part or exudate collecting in the eyes, sinuses, larynx, or nasal cleft may interfere with breathing. When the larynx is involved so severely as to bring about a complete closure or if scabs or exudate become detached and plug the trachea, death from suffocation results.

Diagnosis

The diphtheritic patches in the mouth and throat are thicker, tougher, and more firmly attached in pox than in laryngotracheitis, and the pox ulcers are usually deep and bleed readily. Pox can be distinguished from coryza (page 13) by the fact that cankers seldom appear in coryza even in advanced cases. While vitamin-A deficiency causes a discharge from the eye, and nodules the size of a millet seed or larger appear in the esophagus (gullet), these nodules have smooth surfaces and their presence is usually accompanied by distinguishing changes in the kidneys and other parts of the body.



Fowl pox attacking the eyes. In some flocks fowl-pox lesions such as shown above develop about the eyes. These lesions resemble those seen in some cases of coryza and localized fowl cholera.

Fowl pox may be detected in some doubtful cases by swabbing canker material from a suspected bird upon the scarified comb or plucked skin of a young susceptible bird. If the young bird becomes infected, it is evident that fowl pox was present; however, failure to obtain infection does not exclude the possibility of fowl pox.

Sometimes a rapid laboratory diagnosis is possible if microscopic pox "inclusion bodies" can be detected in specially stained smears from suspected lesions. The incubation period (the time elapsing from exposure to appearance of symptoms and lesions) is from 5 to 8 days in pox, whereas it is 1 to 3 days in laryngotracheitis and bronchitis.

Control

There is no satisfactory treatment for fowl pox. Removal of scabs from the mouth and throat, followed by applications of iodine or some similar agent, may prevent suffocation by keeping the breathing passages clear. Proper rations, well-ventilated clean houses, clean range, and isolation of sick fowls aid in preventing the spread of the disease.

Vaccination is effective in controlling fowl pox. Vaccine prepared from strains of fowl virus gives lasting immunity. The most satisfactory results are obtained in chickens and turkeys 30 to 90 days of age. Fowls younger or older than this are more likely to develop undesirable reactions: egg production is often seriously curtailed and gains in weight retarded, and the birds may die as a result of parasitic or infectious diseases that take hold during this time of lowered resistance. Vaccine prepared from pigeon-pox virus does not cause serious general reactions, but it produces an immunity of limited duration, usually about six months. Under farm flock conditions the protection provided sometimes lasts longer.

For further information pertaining to fowl pox and its control, see Illinois Circular 430, "Fowl Pox."

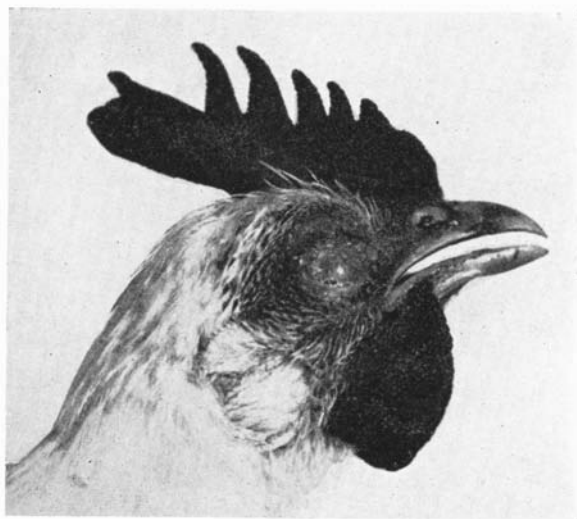
CORYZA (COLDS)

There are two types of coryza, the first characterized by a rapid onset of the symptoms after exposure (one to two days), and the second characterized by slow onset with a nasal discharge appearing two to four weeks after exposure. A specific bacterial infection (*Hemophilus gallinarum*) has been identified with the first type. The cause of the second type is unknown altho some workers found it to be caused by a virus-like agent. Coryza attacks chickens, turkeys, and pheasants of all ages. The mortality is usually heavier in young birds, but seldom is high in any event.

In many early cases of coryza there is a watery nasal discharge which dries and partly or completely plugs the nostrils. Labored breathing and gasping may follow. Bits of straw and feathers adhere to the sticky discharge from the nostrils and eyes. Inflammation and swelling of the wattles and the tissues surrounding the eye are common. Inflammation of the covering of the eyeball, along with a watery discharge and swelling and closure of the tear duct and sinus openings, sometimes causes yellow, cheesy exudate to collect in the eyes and sinuses and causes these parts to bulge. In severe cases the eyelids are pasted together by the discharge. Infection may spread to the trachea, bronchi, and lungs, causing difficult breathing, rattling or "rales," coughing, and sometimes death by suffocation.

The swelling of the head and sinuses soon disappears from chickens that survive the early stages of the disease, but nasal discharge and tracheitis and bronchitis persist indefinitely in some birds. Such birds become very thin and either die or recover slowly. Long-standing cases which show eye and sinus bulging are perhaps in part the result of secondary or complicating factors. These cases are called "roup" by some poultrymen.

An infectious sinusitis (swell head) of turkeys is different from coryza and is not associated with low vitamin A intake. The disease is



Coryza involving eye and nasal passages. In this type of coryza, dried exudate accumulates around the nostrils and causes difficult breathing. The discharge from the eyes sometimes seals the lids.

characterized by nasal discharge, watery eyes, and swelling of the sinuses. Altho only a few turkeys may die, 10 to 90 percent of the flock may be infected, and losses from delayed development of the turkeys may be heavy. Treatment of infectious sinusitis of turkeys in the early stages of the disease has been found beneficial. The exudate, much like egg white in consistency and appearance, is drawn off with a syringe, and 1 cc. of either 15-percent solution of argyrol or 4-percent silver nitrate is injected into the nasal passages.

Diagnosis

Coryza usually spreads less rapidly than bronchitis and laryngo-tracheitis and does not run a definite course. Furthermore a bird that has had the disease does not develop a strong immunity to future attacks. As coryza is frequently complicated by the presence of fowl cholera or fowl pox in the same bird, laboratory tests may be necessary to differentiate among these diseases. In the laboratory the disease is recognized definitely by isolation of the germ or organism that causes it.

Control

There is no specific treatment for coryza, altho irrigation of the nostrils and eyes with mild antiseptic solutions may overcome the discomfort of mechanical interference with breathing. No satisfactory vaccine or bacterin has been developed. Prevention must depend largely on avoiding the introduction of visibly infected or carrier birds into the flock. Some observations suggest that carrier birds are responsible for perpetuating the disease on premises from year to year. Care should be taken to see that the birds have proper rations and housing and that parasites are controlled. Birds whose vitality has been lowered by inadequate rations, improper housing, and parasites are more subject to disease infection and suffer more seriously from it.

LOCALIZED FOWL CHOLERA

The severity of fowl cholera, a bacterial disease, may vary from a generalized infection that may quickly be fatal, to the relatively mild, seldom-fatal infections which remain localized in various parts of the body, such as the eyes, sinuses and wattles. Common symptoms of localized cholera are: swelling of the wattles with abscess formation and the sloughing of affected tissues; swelling of the head and bulging of the sinuses, accompanied by a nasal discharge; and a watery

discharge from the eye, with sealing of the lids, and the collection of a cheesy mass around the eyeball. Joint infections and lameness are also occasionally seen in flocks where this disease prevails.

Diagnosis

Localized fowl cholera may be confused with laryngotracheitis, but it seldom occurs suddenly in a considerable number of birds in the flock, as does laryngotracheitis. It may also resemble coryza closely, but in coryza swelling of the wattles is not accompanied by abscess formation as in cholera.

The eye involvement of cholera is easily distinguished from that resulting from vitamin-A starvation. In cholera the discharge is yellow and is often accompanied by marked swelling and a putrid odor; in vitamin A deficiency there is a whitish mass with less swelling and usually there is no odor.

A positive diagnosis of fowl cholera is reached in the laboratory by isolating the fowl-cholera organism (*Pasteurella avicida*).

Control

Careful and frequent culling, the destruction of birds in advanced stages of the disease, and disposal for immediate slaughter of recovered birds or exposed healthy birds is the only practical way to combat localized fowl cholera. Young stock should be raised on clean areas away from contaminated premises and exposed flocks. Opening the abscesses and irrigating the eyes and nostrils with mild antiseptics has only a limited value because affected birds recover slowly and after recovery may remain carriers. Vaccination with bacterins cannot be depended upon to furnish a satisfactory degree of immunity; and furthermore controlled experiments suggest that cholera vaccination is not justified because of the expense.

A streptococcus infection resembling fowl-cholera infection has been described, but fortunately is quite rare. Laboratory examinations are necessary to differentiate between this streptococcus infection and cholera and similar diseases.

PULLORUM DISEASE

In chicks 10 days to 3 weeks old suffering from pullorum infection, gasping and labored breathing may be seen, but the respiratory symptoms are seldom as pronounced as in cases of infectious bronchitis. Pullorum disease in chicks can be prevented by repeated testing

of flocks, by incubator hygiene, and by sanitary methods of brooding chicks.

Pullorum-infected chicks frequently show a diarrhea, and recovery is rare. Autopsy examination often discloses white to yellow nodules in the lung which indicate pneumonia; whitish nodules also occur quite frequently on the heart surface and in the gizzard muscles. Laboratory examination will allow isolation of the pullorum organism (*Salmonella pullorum*) and definite recognition of pullorum disease.

For further information on pullorum disease, see Illinois Circular 432, "Pullorum Disease of Chicks."

FUNGUS INFECTIONS

Certain fungus, or mold, infections, particularly aspergillosis and moniliasis, or thrush, may involve the respiratory systems of poultry to a varying degree.

Aspergillus infection is encountered occasionally in baby chicks, turkeys, and other birds brooded under damp, insanitary conditions. However, many cases of so-called brooder pneumonia, once thought to be due to aspergillosis, have been shown to be due to pullorum disease. Older birds with aspergillus infection may occasionally suffer from impaired breathing and show mold infection of the air sacs and lungs. The lung nodules are usually smaller than in pullorum disease, altho in chronic cases they are somewhat larger. Very young birds are more likely to die from aspergillosis than are older birds; but low vitality in stock of any age will favor mold infections.

Moniliasis, or thrush, may cause difficult breathing in a small percentage of affected birds that show lesions of the digestive tract.

Because there is no cure or effective treatment for either aspergillosis or moniliasis at present, prevention and control depend on correction of unfavorable brooding or housing conditions and in some flocks on a change in the ration. The possibility that fungi may be carried on the egg shell suggests the advantage of improved nest and incubator sanitation.

OTHER INFECTIOUS DISEASES

Various septicemic diseases, which include intestinal bacterial infections, may be the cause of distressed breathing in poultry. Direct involvement of the lungs may impair heart action as well as lung action, and breathing may be difficult even in the early stages of these diseases. In cases of leucemia and fowl paralysis a small proportion of

the birds in a flock harboring the diseases may show intermittent gasping for air as a result of involvement of the vagus nerve, the nerve which supplies functions of sensation and motion to larynx, lungs, heart, esophagus, and other abdominal organs.

Autopsies of a number of affected birds usually will serve to detect leucemia and paralysis if they are present in the flock. Paratyphoid and colibacillosis often require laboratory examination for differentiation and for distinction from other diseases.

Where any of these diseases are suspected, affected birds should be promptly disposed of and general sanitary measures put vigorously into effect.

VITAMIN-A DEFICIENCY

Chickens or poults on range inadequately supplied with green feed or receiving a ration low in vitamin A are subject to vitamin-A starvation. Some of the symptoms and changes that accompany a deficiency of vitamin A may be confused with those caused by various infectious and parasitic diseases. The white cheesy material which collects in the eye and is easy to remove differs from the yellowish mass present in cases of localized cholera, complicated coryza, and fowl pox.

In vitamin-A starvation there is no definite inflammation of the mucous membrane of the mouth and no foul odor, as there are in other diseases of the respiratory tract. Furthermore the millet-sized swellings of the mucous glands of the esophagus and, particularly in



Vitamin-A starvation. A deficiency of vitamin A in the ration was the cause of this bird's respiratory trouble. The white cheesy exudate in the eye and the swollen mucous glands in the esophagus are typical of this disease. Fresh green feed, carrots, and yellow corn are good sources of vitamin A.

turkeys, the dry casts in the trachea, together with lung lesions, serve to differentiate vitamin-A deficiency from other infections.

Deposits of urates in the kidneys and sometimes in the abdominal membranes and the joints are characteristic of vitamin-A deficiency.

Control

Prevention and control of the illnesses due to vitamin-A deficiency depend on providing a ration rich in this vitamin. Such a ration is especially necessary for turkeys, whose vitamin requirements are considerably greater than those of chickens. Fresh green feed, carrots, and yellow corn are good natural sources of vitamin A. Hay, unless it is properly cured, loses much of its vitamin A content.

In winter and during seasons of severe drouth cod-liver oil or other fish-liver oils should be added to the diet. Since the vitamins in fish-liver oil are injured if the oils are old or rancid or if they are exposed to light and air, only limited quantities in sealed containers protected from the light should be purchased at a time. Some flock owners add the necessary quantity of fish oil to the scratch grain twice a week rather than risk losing the vitamins in the fish oil by mixing it with the bulk mash for continuous feeding. Proper packing and storage will do much to reduce loss of vitamins in the feed.

Only high-grade vitamin-tested oils are satisfactory; inferior grades are expensive at any price.

RESPIRATORY PARASITES

Gapeworms

Gapeworms (*Syngamus trachea*) are rare in chickens and turkeys in Illinois. They occur to an unknown extent among pheasants, partridges, and numerous other wild birds. Gapeworms may cause serious losses in young stock, but older chickens are seldom seriously harmed by these parasites. Turkeys of all ages may harbor considerable numbers of the parasites without the serious effects seen in chickens. The parasite causes the trachea to become inflamed and considerable mucus collects in it. An infected bird extends its neck and gasps as do birds affected by bronchitis and laryngotracheitis.

Finding red forked worms in the trachea establishes the diagnosis.

Control. Control of gapeworms depends largely on preventive measures. The litter should be changed frequently, and a well-drained range should be provided. Young chickens should not be allowed on ground where turkeys have ranged. Removal of the worms from the

trachea by mechanical means, such as a feather or a coiled horsehair, often fails and sometimes causes death by suffocation.

Dusting with finely powdered barium antimonyl tartrate has recently been found effective in treating gapeworms. Affected birds are placed in a closed box, and the powder is blown in with a blowgun thru an opening in the top. One ounce of powder is used for each 8 cubic feet of box space. One-third of the dose is blown in at a time at intervals of 5 to 10 minutes, and after each treatment the box is tilted from side to side. Five minutes after the last treatment the birds are released.

Air Sac Mite

The air sac mite (*Cytoleichus nudus*) occurs in the air sacs of poultry and occasionally in other body cavities, in the trachea, and in the bones of chickens and turkeys. When present in the trachea in considerable numbers, these mites cause marked irritation. With irritation, mucus collects and the birds gasp for air.

Usually only old birds in flocks kept on premises that have been used for a long time are seriously infested by the air sac mite, and very few infested birds show disturbed breathing.

Control. Proper sanitary practices seem to effectively prevent serious infestation with these parasites.

OTHER CAUSES OF IMPAIRED BREATHING

Pressure, such as that caused by tumors or abscesses in the respiratory tract, spinal cord, or brain, or in adjacent tissues, may interfere with normal breathing. Impaction of the crop or proventriculus (glandular stomach) may likewise impair breathing. Obviously such conditions generally occur in individual cases only, and it is usually better to destroy such birds than to attempt to cure them.

When chicks are exposed to prolonged or excessive fumigation with formaldehyde in the incubator, serious difficulties may develop. The eyes show irritation, and the nasal cavities and tongue become dark and dry. Many chicks die within a short time with marked gasping. The use, and over-use, of various sprays and vapors also may cause serious and permanent damage to the respiratory tract.

Improper ventilation of the brooder houses, particularly if the stove is not operating correctly, may cause carbon-monoxid poisoning which results in acutely distressed breathing and heavy mortality. The tissues affected by carbon monoxid are often a bright red, but definite recognition of poisoning may require laboratory examination.